1 of 3

[10191/1146]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

#23/w.m.
3/11/03

In re Application of:		Examiner: Kaj K. Olsen
	Harald NEUMANN	
For:	ARRANGEMENT FOR WIRING AN ELECTROCHEMICAL SENSOR	
Filed:	August 6, 1999	Art Unit: 1744
Serial No.:	09/369,767	

Assistant Commissioner
for Patents
Washington, D.C. 20231

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Date 2/24/2003 Atty's Reg. #. 33,865

Atty's Signature AARON C. DEDITCH

APPEAL BRIEF PURSUANT TO 37 C.F.R. § 1.192(a)

SIR:

In the above-identified patent application ("the present application"), Appellants mailed a Notice Of Appeal on October 18, 2002 (which was filed by the Patent Office on October 23, 2002) from the Final Office Action mailed by the U.S. Patent and Trademark Office on June 19, 2002, so that the two-month appeal brief filing date is December 23, 2002, which has been extended by two months to February 24, 2003 (since February 23, 2003 is a Sunday) by the accompanying Transmittal And Petition To Extend. In the Final Office Action, claims 1 to 22 were finally rejected.

A Response After A Final Office Action was mailed on August 28, 2002. An Advisory Action was mailed on September 23, 2002.

In accordance with 37 C.F.R. § 1.192(a), this Appeal Brief is being submitted in triplicate in support of the appeal of the final rejections of claims 1 to 22. It is respectfully submitted that the final rejections of claims 1 to 22 should be reversed for the reasons set forth below.

1. REAL PARTY IN INTEREST

The real party in interest in the present appeal is Robert Bosch GmbH ("Robert Bosch") of Stuttgart in the Federal Republic of Germany. Robert Bosch is the assignee of the entire right, title and interest in the present application.

2. RELATED APPEALS AND INTERFERENCES

There are no interferences or other appeals related to the present application, which "will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal".

3. STATUS OF CLAIMS

1. Claims 1 and 5-14 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 4,909,922 to Kato et al. ("the Kato reference") in view of any of U.S. Patent No. 4,629,549 to Kojima et al. ("the Kojima reference"), U.S. Patent No. 4,787,966 to Nakajima et al. ("the Nakajima reference"), U.S. Patent No. 5,203,983 to Ohyama et al. ("the Ohyama reference"), and/or U.S. Patent No. 4,365,604 to Sone ("the Sone reference") and Logothetis et al. ("High-temperature Oxygen Sensors," ACS Symposium Series) ("the Logothetis reference").

2. Claims 2-4 and 21 were rejected under 35 U.S.C. § 103(a) as unpatentable over the Kato reference and the Ohyama, Kojima, Nakajima or Sone references in further view of the Logothetis reference.

3. Claims 1, 7, 8, 10, 12-15, 19 and 20 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 4,400,260 to Stahl et al. ("the Stahl reference") in view of the Ohyama, Kojima, Nakajima or Sone references, and as evidenced by the Logothetis reference.

4. Claims 1-14 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 5,413,683 to Murase et al. ("the Murase reference") in view of the Kato reference.

5. Claims 15-20 and 22 were rejected under 35 U.S.C. § 103(a) as unpatentable over the Kato and Ohyama, Kojima, Nakajima, or Sone (with or without the teaching of

Logothetis) as applied to claims 1 and 21 above, and in further view of Liu et al. ("Oxygen Sensors" from Engineered Materials Handbook, Vol. 4) ("the Liu reference").

6. Claims 15-17, 19 and 20 were rejected under 35 U.S.C. § 103(a) as unpatentable over the Murase in view of Kato as applied to claim 1 above, and further in view of the Liu reference.

A copy of the appealed claims is attached hereto in the Appendix.

4. STATUS OF AMENDMENTS

In response to the Final Office Action mailed on June 19, 2002, Appellant filed a Response After A Final Office Action ("the Response After Final"), which was mailed on August 28, 2002.

5. SUMMARY OF THE INVENTION

The problem addressed by the subject matter of the claims is directed to the problem of electrochemical solid electrolyte sensors. These sensors determine the oxygen content in exhaust gases of internal combustion engines, and operate according to the so-called Nernst principle, according to which an electromotive force (EMF) is picked off, as the probe voltage, between a reference electrode having an excess of oxygen and a measurement electrode to which the measured gas is applied. The EMF occurs if an oxygen concentration of λ is less than one is present in the measured gas, where stoichiometric conditions are present in the measured gas when λ is one. The probe voltage is conveyed to a control device as a measurement signal. Electrochemical solid electrolyte sensors require a temperature of at least 300° C to operate. An electrical resistance heater, operated with a heating voltage that corresponds (when the sensor is used in a motor vehicle) to the vehicle's battery voltage, is integrated into the solid electrolyte sensor for that purpose. The reference electrode of the solid electrolyte sensor is connected as the positive electrode. The measurement electrode is connected to ground (negative pole). When solid electrolyte sensors are operated, it is found that coupling of the heat voltage into the probe voltage occurs. This falsifies the measurement signal. (See specification at page 1, lines 2 to 20).

The exemplary arrangement according to the present invention has the advantage that coupling of the heater voltage can effectively be blocked. Coupling is most effectively

prevented if the electrode adjacent to the resistance heater lies in a layer plane of the solid electrolyte element, and has at least approximately the surface extent of the further electrode. (See id. at page 1, lines 23 to 28).

Figure 1 shows an electrochemical oxygen sensor with a schematic depiction of an electrical wiring layout. The sensor has a ceramic element 11 made of a ceramic that conducts oxygen ions (for example stabilized ZrO_2), a measurement electrode 12, and a reference electrode 13. Measurement electrode 12 is exposed to a measured gas. Reference electrode 13 is arranged in a reference duct 15 that communicates with a reference gas, e.g. air. An electrical resistance heating element 17 that is embedded in an electrical insulator 18 is integrated into ceramic element 11. (See id. at page 2, lines 13 to 19).

The electrical wiring layout of electrodes 12, 13, and resistance heater 17 is depicted schematically, resistance heater 17 being operated with a heating voltage U_H of, for example, 12 V. The negative terminal is connected to ground. Measurement electrode 12, constituting the negative electrode, is also connected to ground. Reference electrode 13 is operated as the positive electrode. (See id. at page 2, lines 21 to 25).

Figure 2 shows the same solid electrolyte sensor as in Figure 1, but with the electrical wiring layout according to the present invention, according to which reference electrode 13, constituting the positive electrode, is connected to ground. Measurement electrode 12 is wired as the negative electrode. According to the present invention, the electrode located closest to resistance heater 17 - which in the present case is reference electrode 13 - is connected to ground. A negative probe voltage U_S is thereby created. The result is that a negative operating voltage U_B, which powers a circuit arrangement for analyzing the negative probe voltage U_S, is made available via a circuit that is known per se. The necessary circuit for generating a negative operating voltage U_B is available to one skilled in the art. (See id. at page 2, line 27 to page 3, line 5).

A further exemplary embodiment of an oxygen sensor is evident from Figure 3. What is arranged here is a reference electrode 20 that extends over the width of reference duct 15 and possesses, approximately in the layer plane, the surface extent of measurement electrode 12. The larger-area reference electrode 20 thus additionally acts as a shield against any coupling of heater voltage U_H into measurement electrode 12. The further elements of the exemplary embodiment in Figure 3 correspond to the exemplary embodiment in Figure 2. (See id. at page 3, lines 7 to 13).

The wiring layout according to the present invention is moreover also usable in

electrochemical pump cells in which oxygen is pumped by application of a pump voltage, and the limiting current which flows in that context is utilized as the measurement signal. The negative operating voltage U_B is used in this context as the pump voltage. (See id. at page 3, lines 21 to 25).

In summary, the present invention is directed to an electrochemical sensor that includes a solid electrolyte element including at least one first electrode, at least one second electrode and at least one heating element, the at least one second electrode being situated closer than the at least one first electrode to the at least one heating element , the at least one second electrode being coupled to ground, the at least one first electrode coacting with the at least one second electrode and being negatively polarized. (See claim 1).

The present invention is also directed to an electrochemical sensor that includes a solid electrolyte element including at least one first electrode, at least one second electrode and at least one heating element, the at least one second electrode being situated closer than the at least one first electrode to the at least one heating element, the at least one second electrode being coupled to ground, the at least one first electrode coacting with the at least one second electrode and being negatively polarized such that coupling of heater voltage is effectively blocked. (See claim 13).

The present invention is also directed to an electrochemical sensor arrangement that includes: a solid electrolyte element including a reference duct, ZrO_2, at least one first electrode, at least one second electrode, at least one heating element and a reference duct situated between the at least one first electrode and the at least one heating element, the at least one second electrode coupled to ground, having approximately the same surface size as the at least one first electrode, lying in a layer plane of the solid electrolyte element, and situated inside the reference duct closer than the at least one first electrode to the at least one heating element, the at least one first electrode coacting with the at least one second electrode and being negatively polarized; an arrangement to provide a negative operating voltage so that a coupling of a heater voltage is effectively blocked, the negative operating voltage being applied to the negatively polarized electrode; a measurement circuit, the negative operating voltage powering the measurement circuit; and a circuit arrangement to analyze a negative probe voltage, the negative operating voltage powers the circuit arrangement. (See claim 21).

6. ISSUES

1. Under 35 U.S.C. § 103(a), are claims 1 and 5-14 patentable over U.S. Patent No.

4,909,922 to Kato et al. ("the Kato reference") in view of any of U.S. Patent No. 4,629,549 to Kojima et al. ("the Kojima reference"), U.S. Patent No. 4,787,966 to Nakajima et al. ("the Nakajima reference"), U.S. Patent No. 5,203,983 to Ohyama et al. ("the Ohyama reference"), and/or U.S. Patent No. 4,365,604 to Sone ("the Sone reference") and Logothetis et al. ("High-temperature Oxygen Sensors," ACS Symposium Series) ("the Logothetis reference")?

2. Under 35 U.S.C. § 103(a), are claims 2-4 and 21 patentable over the Kato reference and the Ohyama, Kojima, Nakajima or Sone references in further view of the Logothetis reference?

3. Under 35 U.S.C. § 103(a), are claims 1, 7, 8, 10, 12-15, 19 and 20 patentable over U.S. Patent No. 4,400,260 to Stahl et al. ("the Stahl reference") in view of the Ohyama, Kojima, Nakajima or Sone references, and as evidenced by the Logothetis reference?

4. Under 35 U.S.C. § 103(a), are claims 1-14 patentable over U.S. Patent No. 5,413,683 to Murase et al. ("the Murase reference") in view of the Kato reference?

5. Under 35 U.S.C. § 103(a), are claims 15-20 and 22 patentable over the Kato and Ohyama, Kojima, Nakajima, or Sone (with or without the teaching of Logothetis) as applied to claims 1 and 21 above, and in further view of Liu et al. ("Oxygen Sensors" from Engineered Materials Handbook, Vol. 4) ("the Liu reference")?

6. Under 35 U.S.C. § 103(a), are claims 15-17, 19 and 20 patentable over the Murase in view of Kato as applied to claim 1 above, and further in view of the Liu reference?

7. GROUPING OF CLAIMS

Issue 1: Group 1: Claims 1 and 6-14 stand or fall together.
Group 2: Claim 5 stands alone.

Issue 2: Group 1: Claims 2-4 and 21 stand or fall together.

Issue 3: Group 1: Claims 1, 7, 8, 10, 12-15, 19 and 20 stand or fall together.

Issue 4: Group 1: Claims 1-14 stand or fall together.

Issue 5: Group 1: Claims 15-20 and 22 stand or fall together.

Issue 6: Group 1: Claims 15-17, 19 and 20 stand or fall together.

8. ARGUMENT

Claims 1 to 22 are currently pending in this application.

Issue 1: Group 1

Claims 1 and 5-14 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 4,909,922 to Kato et al. ("the Kato reference") in view of any of U.S. Patent No. 4,629,549 to Kojima et al. ("the Kojima reference"), U.S. Patent No. 4,787,966 to Nakajima et al. ("the Nakajima reference"), U.S. Patent No. 5,203,983 to Ohyama et al. ("the Ohyama reference"), and/or U.S. Patent No. 4,365,604 to Sone ("the Sone reference") and Logothetis et al. ("High-temperature Oxygen Sensors," ACS Symposium Series) ("the Logothetis reference"). Applicant respectfully traverses.

The claimed subject matter, as recited in independent claim 1, relates to an electrochemical sensor that includes a "solid electrolyte element including at least one first electrode, at least one second electrode and at least one heating element" where the "at least one second electrode [is] *coupled to ground*" and the "at least one first electrode coacting with the at least one second electrode and [is] *negatively polarized*."

As explained in the "Summary Of The Invention" section of the present application, the claimed subject matter is directed to providing the benefit of effectively blocking a coupling of the heater voltage by grounding the reference electrode. It is also noted that in the context of the claim, if one electrode of the claim is negatively polarized, the other electrode is positive.

The Kato reference purportedly concerns an electrochemical sensor comprising a solid electrolyte element including a first electrode, a second electrode in the reference duct, and a heating element, in which the second electrode is situated closer to the heating element than the first electrode.

To rely on a reference as a basis for rejecting an applicant's invention, the reference "must either be in the field of applicant's endeavor" or be "reasonably pertinent to the

particular problem with which the inventor was concerned." *In re Oetiker*, 977 F.2d 1443, 1446 (Fed. Cir. 1992). Thus, to rely on a reference under 35 U.S.C. § 103, it must be analogous prior art. *See* M.P.E.P. § 2141.01(a). To reject a claim based on obviousness, however, there must be some suggestion or motivation to modify a reference or to combine reference teachings in a manner contemplated by the claim, and the prior art references (alone or combined) must teach or suggest all of claim limitations. *See* M.P.E.P. § 2142.

The Final Office Action asserts that although the lower potential element is not specified as ground, it is "conventional in the art" to use ground as the lower potential element. The Final Office Action refers to the Sone, Ohyama, Nakajima and Kojima references that allegedly show the use of ground as a negative potential for a heating element. The Final Office Action further asserts that it would have been "obvious" to use ground as a potential for the second electrode of claim 1, without any support from any of the references.

As regards the Kato reference, this reference refers to an oxygen sensor with a built-in electric heating arrangement, which is intended to be simple in construction and water tight (Kato, column 2, lines 41-47). In contrast, the claimed subject matter is directed to an electrochemical sensor that addresses the problem of effectively blocking the coupling of the heater voltage by grounding the reference electrode. It is respectfully submitted that any review of the Kato reference makes plain that it is not reasonably pertinent to the problem of effectively blocking any coupling of the heater voltage. Thus, it is respectfully asserted that this reference is non-analogous prior art.

It is also respectfully submitted that the references relied upon would not motivate a person having ordinary skill in the art to use ground as a potential for the second electrode, as recited in the context of claim 1, for providing an electrochemical sensor that provides the benefit of effectively blocking coupling of the heater voltage by grounding the reference electrode.

The secondary Sone, Ohyama, Nakajima or Kojima references do not cure the critical deficiencies of the primary Kato reference. Regardless of whether Kato, Sone, Ohyama, Nakajima or Kojima may refer to using ground as the negative potential of an automotive battery -- so that there is no motivation to combine because they address different problems and/or concern automotive batteries --as suggested in the Final Office Action, these references (whether taken alone or in combination) simply do not describe or suggest "*at least one second electrode . . . coupled to ground*" as recited in the context of claim 1, for providing an electrochemical sensor that operates to effectively block coupling of the heater

voltage.

It is therefore respectfully submitted that the references relied on (whether taken alone or otherwise) do not describe nor suggest the presently claimed subject matter for the reasons discussed above. As such, it is respectfully requested that the obviousness rejection of claim 1 be withdrawn, since claim 1 is allowable.

Since claims 2-12 and 14-20 depend from claim 1, it is respectfully submitted that these claims are allowable for at least the same reasons as claim 1.

Claim 13 includes features analogous to those of claim 1, and it is therefore allowable for at least the same reasons as claim 1.

The Final Office Action also conclusorily asserts that the "first electrode would *inherently* be negatively polarized by induced EMF." With regard to the use of the anticipation doctrine of "inherency" in an obviousness rejection, the Board of Patent Appeals & Interferences in *Ex parte Schricker* has stated that:

> [O]n the one hand the examiner talks in terms of inherency (which is really an anticipation rationale) while on the other hand the examiner talks in terms that it would have been obvious to experiment to divine optimum conditions.
>
> *Inherency and obviousness are somewhat like oil and water -- they do not mix well.* Claimed subject matter can be anticipated because a prior art reference describes a method which inherently meets the limitations of a claimed method. Claimed subject matter can be unpatentable for obviousness when, notwithstanding a difference between that subject matter and a prior art reference, the claimed subject matter, as a whole, would have been obvious.

(*See Ex parte Schricker*, 56 U.S.P.Q.2d 1723, 1725 (Bd. Pat. App. & Int. 2000) (obviousness rejections vacated and remanded) (citations omitted; unpublished)).

It is therefore respectfully submitted that the Final Office Action wrongly relies on inherency to support an otherwise unsupportable obviousness assertion.

Issue 1: Group 2

As further regards claim 5 (in addition to the arguments as to claim 1 from which it depends), the Final Office Action conclusorily asserts that both Nakajima and Kojima refer to electrodes of the same size, and further asserts that it would have been obvious to a person

with ordinary skill in the art to use electrodes of the same size, since the art already recognizes the use of electrodes of equal size. Further, the Final Office Action relies on *In re Rose*, 220 F.2d 459 (C.C.P.A. 1955), to assert that a change in size is generally recognized as being within the level of ordinary skill in the art.

With respect to Nakajima and Kojima, it is believed that these references both refer to oxygen sensors having electrodes situated on opposite sides of a solid electrolyte. The Final Office Action, however, does not indicate in what way the text of these references suggest that the electrodes may be the same size. To reject claims for obviousness, the examiner "must cite the best references at his or her command," and when a reference "shows or describes inventions other than that claimed by the applicant, the particular part relied on must be designated as nearly as practicable." 37 C.F.R. § 1.104(c)(2). Furthermore, the mere possibility that some of the drawings of Nakajima and Kojima may show electrodes that appear to be similar in size (which is not conceded) does not mean that the electrodes of the drawings are the same size. When a reference does not disclose that drawings are to scale and is silent as to dimensions, arguments based on the measurement of the drawing features are of little value. *See Hockerson-Halberstadt, Inc. v. Avia Group Int'l*, 222 F.3d 951, 956 (Fed. Cir. 2000). The Nakajima and Kojima references do not state (or even suggest) that any of the drawings -- including any of the electrodes -- are made to scale or properly dimensioned. It is therefore respectfully submitted that the possibility that the drawings of Nakajima and Kojima may contain electrodes that *appear* similar in size cannot form the basis for concluding that these references "set forth the use of electrodes which are all the same size," as asserted in the Final Office Action.

As to *In Re Rose*, that case concerned a lumber package composed of individual bundles of lumber that varied in length. *In re Rose*, 220 F.2d at 822. The *Rose* Court stated that the weight of the bundles was not "patentably significant since it at most relates to the size of the [lumber]." *Id.* In contrast, claim 5 provides that the second electrode has "approximately the *same surface size* as the at least one first electrode," which was not arbitrarily chosen, and as expressed in the Specification, increasing the size of the second electrode so that it has "approximately the *same surface size* as the at least one first electrode" provides the benefit of further shielding against any coupling of the heater voltage U_H into the measurement electrode (i.e., the at least one first electrode). (Specification, page 3, lines 7 to 11). It is therefore respectfully submitted that claim 5 is allowable for this further reason.

Issue 2: Group 1

Claims 2-4 and 21 were rejected under 35 U.S.C. § 103(a) as unpatentable over the Kato reference and the Ohyama, Kojima, Nakajima or Sone references in further view of the Logothetis reference.

It is respectfully submitted that any review of the third-level Logothetis reference makes plain that it simply does not cure the critical deficiencies of the primary or secondary references, and that claims 2 to 4 are therefore allowable for the same reasons as claim 1, as explained above with respect to the Kato reference.

Claim 21 includes features like those of claim 1, and is therefore allowable for essentially the same reasons as claim 1.

Issue 3: Group 1

Claims 1, 7, 8, 10, 12-15, 19 and 20 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 4,400,260 to Stahl et al. ("the Stahl reference") in view of the Ohyama, Kojima, Nakajima or Sone references, and as evidenced by the Logothetis reference.

Although Stahl does not specify that the lower potential terminal is connected to ground, the Final Office Action asserts that it would have been obvious to one having ordinary skill in the art to use the "teachings" of Ohyama, Kojima, Nakajima or Stone with the sensor of the Stahl reference. With respect to polarization of the first electrode, the Final Office Action asserts that if the "oxygen were greater in the measured portion than in the reference passage, the first electrode would be inherently polarized," and further asserts that the claim does not specify an operating condition where the measured gas concentration is less than the reference gas composition, so that the system of Stahl would (in potentiometric mode) *inherently* meet the polarization limitation "when the measured gas is of a greater concentration than the reference gas."

First, as regards the obviousness of using ground (as recited in the context of the subject matter as claimed), the secondary Ohyama, Kojima, Nakajima or Stone references in view of the third-level Logothetis reference do not cure the critical deficiencies of the primary Stahl reference for the same reasons as explained above with respect to the Kato reference. Second, it is respectfully believed and submitted that the Final Office Action's assertion that the system of Stahl would, in potentiometric mode, "*inherently* meet the polarization limitation when the measured gas is of a greater concentration than the reference gas" is not

correct.

Claim 1 provides that the first electrode (that is, the one in contact with the measured gas) is the one that is negatively polarized. But in potentiometric mode (that is, when a reverse oxygen pump is not used), the first electrode may be negatively polarized when a measured amount of oxygen *is less than* an amount of oxygen in a reference gas (that is, when the oxygen partial pressure of the measured gas is less than that of the reference gas) -- and not vice versa as suggested by the Final Office Action. The Logothetis reference specifically states that at the "lower oxygen partial pressure side, two oxygen ions combine to give an oxygen molecule to the gas phase leaving four electrons on the . . . electrode," so that the "net result . . . is the transfer of . . . four electrons from electrode 2 to electrode 1". (Logothetis, page 137, paragraph 3). Thus, since the electrode on the lower oxygen partial pressure side is the one that receives the four extra electrons and since electrons are negatively charged, the electrode on the measured gas side is the one that is negatively polarized because the measurement gas has a lower oxygen partial pressure.

In short, since the first electrode of claim 1 may not be negatively polarized in potentiometric mode if the measured oxygen concentration is greater than the reference oxygen concentration, the Final Office Action's assertion that "Stahl would *inherently* meet the polarization limitation when the measured gas is of a greater concentration than the reference gas" is not correct.

For at least the foregoing reasons, claim 1 is allowable. Since claims 7, 8, 10, 12, 14, 15, 19 and 20 depend from claim 1, it is respectfully asserted that these claims are also allowable for the same or for essentially the same reasons as claim 1.

Since claim 13 includes features analogous to those of claim 1, claim 13 is allowable for essentially the same reasons as claim 1.

Issue 4: Group 1

Claims 1-14 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 5,413,683 to Murase et al. ("the Murase reference") in view of the Kato reference.

The Murase reference purportedly concerns an oxygen sensing apparatus for detecting an oxygen concentration of a gas, including a first electrochemical cell having an oxygen-ion conductive solid electrolyte body and a reference and a measuring electrode, for producing an electromotive force corresponding to the oxygen concentration of the gas.

With respect to the first assertion of the Final Office Action, Murase does not disclose

coupling a second (reference) electrode to ground, but it instead refers to a reference electrode 24 connected to both a power source 34 across a resistor and an electronic circuit 38. With respect to the second assertion, any review of Murase makes plain that the second electrode of Murase does not communicate with an atmosphere 16 and that it does not read on the specification term "reference duct" for at least the following reasons. First, reference numeral "16" of Murase does not label an "atmosphere", as suggested by the Final Office Action, but it labels a measurement-gas chamber. (*See* Murase, col. 8, lines 17 to 20). Second, the measurement-gas chamber 16 of Murase is not "situated between the at least one first electrode and the at least one heating element," as is the reference duct of claim 9. Third, the reference electrode 24 of Murase is not "in the reference duct," as provided for by claim 9.

I w/drew this rejection

why are arguing it

Also, with respect to the third assertion, the term "reference," as used in the claims and as understood with respect to the Specification, is clearly defined. In particular, the terms of a claim are not interpreted in a vacuum, since a pending claim must be "given the broadest reasonable interpretation consistent with the specification." M.P.E.P. § 2111.

Still further, the law plainly supports the foregoing eminently reasonable interpretation of "reference" based on the specification. (See *In re Weiss*, 26 U.S.P.Q.2d 1885, 1887 (Fed. Cir. 1993) (when interpreting a claim term or phrase, one must "look to the specification for the meaning ascribed to that term"; Board reversed) (unpublished decision); *In re Okuzawa*, 190 U.S.P.Q. 464, 466 (C.C.P.A. 1976) ("claims are not to be read in a vacuum, and limitations therein are to be interpreted in light of the specification in giving them their broadest *reasonable* interpretation"; Board reversed; emphasis in original) (citing *In re Royka*, 180 U.S.P.Q. 580, 582-83 (C.C.P.A. 1974) (claims are "not to be read in a vacuum and while it is true that they are to be given the broadest reasonable interpretation during prosecution, their terms still have to be given the meaning called for by the specification of which they form a part"; Board reversed; emphasis in original); and *In re Rohrbacher*, 128 U.S.P.Q. 117, 119 (C.C.P.A. 1960) (an "applicant is his own lexicographer and words used in his claims are to be interpreted in the sense in which they are used in the specification"; Board reversed)). It is respectfully submitted that this is exactly the case here since contrary to the foregoing law, the Office Actions simply reflect an unreasonable reading of "reference" without regard to the sense in which that term is used in the specification. Thus, the Specification and the claims clearly define the use of the term "reference" as used in the claims.

With respect to the fourth assertion, the Final Office Action does not identify a single

line of text or a drawing that would indicate that the Murase reference discloses electrodes of similar size. The Office has the initial burden of demonstrating a *prima facie* case of obviousness and, as explained above, in rejecting claims for obviousness, the "examiner must cite the best references at his or her command," and when a reference "shows or describes inventions other than that claimed by the applicant, the particular part relied on must be designated as nearly as practicable." 37 C.F.R. § 1.104(c)(2).

Therefore, for at least the foregoing reasons, it is respectfully asserted that independent claim 1 and dependent claim 9 are allowable. Further, since claims 2-8 and 10-12 depend from claim 1, it is respectfully submitted that claims 2-8, 10-12 and 13 are allowable for the same or for essentially the same reasons as claim 1.

Since claim 13 includes features analogous to those of claim 1, it is allowable for essentially the same reasons as claim 1.

Issue 5: Group 1

Claims 15-20 and 22 were rejected under 35 U.S.C. § 103(a) as unpatentable over the Kato and Ohyama, Kojima, Nakajima, or Sone (with or without the teaching of Logothetis) as applied to claims 1 and 21 above, and in further view of Liu et al. ("Oxygen Sensors" from Engineered Materials Handbook, Vol. 4) ("the Liu reference").

Claim 15 is directed to a "sensor" in which the "solid electrolyte element includes a solid electrolyte tube that is closed on one side."

The Final Office Action asserts that the Liu reference teaches that oxygen sensors can be conventionally constructed using a tubular configuration. It further asserts that it would have been obvious to one of ordinary skill in the art to use the teachings of the Liu reference for the sensors of Kato and Murase because the art recognized that tubular elements are an alternative form of sensor construction and because substituting one known way of constructing a sensor for another (when the results are not unexpected) requires only routine skill in the art.

The references used to support an obviousness rejection must be analogous prior art. *In re Oetiker*, 977 F.2d at 1446. As stated above as to claim 1, the Kato reference, as well as the secondary Ohyama, Kojima, Nakajima, and Sone references are non-analogous art. As such, it is respectfully submitted that claims 15-20 and 22 are allowable for at least the same reasons as their respective base, independent claims 1 and 21, as explained above.

As regards the secondary Liu reference, it is believed that any review of that reference

makes plain that it concerns operational aspects of oxygen sensors (*see* Liu, page 1131, column 1, first paragraph), and that the Liu reference is non-analogous art and therefore cannot be used to support an obviousness rejection. Thus, it is respectfully submitted that claims 15-20 and 22 are allowable.

Issue 6: Group 1

Claims 15-17, 19 and 20 were rejected under 35 U.S.C. § 103(a) as unpatentable over the Murase in view of Kato as applied to claim 1 above, and further in view of the Liu reference.

For the reasons discussed previously, it is respectfully submitted that claims 15-17, 19 and 20 are allowable for essentially the same reasons claim 1 is allowable, since the secondary Liu reference does not cure the critical deficiencies of the primary references.

As further regards all of the obviousness rejections, to reject a claim as obvious under 35 U.S.C. § 103, the prior art must disclose or suggest each claim element and it must also suggest combining the elements in the manner contemplated by the claim. (See Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 934 (Fed. Cir. 1990), cert. denied, 111 S. Ct. 296 (1990); In re Bond, 910 F.2d 831, 834 (Fed. Cir. 1990)). Thus, the "problem confronted by the inventor must be considered in determining whether it would have been obvious to combine the references in order to solve the problem." (See Diversitech Corp. v. Century Steps, Inc., 850 F.2d 675, 679 (Fed. Cir. 1998)). It is respectfully submitted that, as discussed above, the references relied on, whether taken alone or combined, do not suggest in any way modifying or combining the references so as to provide the presently claimed subject matter for addressing the problems referred to above and in the specification, as discussed above.

Moreover, the Federal Circuit in the case of In re Kotzab has made plain that even if a claim concerns a "technologically simple concept" -- which is not believed to be the case here, there still must be some finding as to the "specific understanding or principle within the knowledge of a skilled artisan" that would motivate a person having no knowledge of the claimed subject matter to "make the combination in the manner claimed" to provide the advantages and/or benefits of the claimed subject matter, stating that:

> In this case, the Examiner and the Board fell into the hindsight trap. The idea of a single sensor controlling multiple valves, as

> opposed to multiple sensors controlling multiple valves, is a technologically simple concept. *With this simple concept in mind, the Patent and Trademark Office found prior art statements that in the abstract appeared to suggest the claimed limitation. But, there was no finding as to the specific understanding or principle within the knowledge of a skilled artisan that would have motivated one with no knowledge of Kotzab's invention to make the combination in the manner claimed.* In light of our holding of the absence of a motivation to combine the teachings in Evans, we conclude that the Board did not make out a proper *prima facie* case of obviousness in rejecting [the] claims . . . under 35 U.S.C. Section 103(a) over Evans.

(See In re Kotzab, 55 U.S.P.Q.2d 1313, 1318 (Federal Circuit 2000) (italics added)). Here again, there have been no such findings to establish that the features discussed above of the rejected claims are met by the references relied upon. As referred to above, any review of the references, whether taken alone or combined, makes plain that they simply do not describe the features discussed above of the rejected claims.

The cases of In re Fine, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988), and In re Jones, 21 U.S.P.Q.2d 1941 (Fed. Cir. 1992), also make plain that the Final Office Action's generalized assertions that it would have been obvious to modify the reference(s) relied upon do not properly support a § 103 rejection. It is respectfully suggested that those cases make plain that the Final Office Action reflects a subjective "obvious to try" standard, and therefore does not reflect the proper evidence to support an obviousness rejection based on the references relied upon. In particular, the Court in the case of In re Fine stated that:

> The PTO has the burden under section 103 to establish a *prima facie* case of obviousness. It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. This it has not done. . . .
>
> . . . .
>
> **Instead, the Examiner relies on hindsight in reaching his obviousness determination. . . . One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.**

(In re Fine, 5 U.S.P.Q.2d at 1598 to 1600 (citations omitted; italics in original; emphasis

added)).

Likewise, the Court in the case of <u>In re Jones</u> stated that:

> Before the PTO may combine the disclosures of two or more prior art references in order to establish *prima facie* obviousness, there must be some suggestion for doing so, found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. . . .
>
> **Conspicuously missing from this record is any evidence, other than the PTO's speculation (if it be called evidence) that one of ordinary skill . . . would have been motivated to make the modifications . . . necessary to arrive at the claimed [invention].**

(<u>In re Jones</u>, 21 U.S.P.Q.2d at 1943 & 1944 (citations omitted; italics in original)).

That is exactly the case here since it is believed and respectfully submitted that the Office Actions to date offer only conclusory hindsight, reconstruction and speculation, which these cases have indicated does not constitute evidence that will support a proper obviousness finding. Accordingly, it is respectfully submitted that the assertions to date in this regard are insufficient since the Office must provide proper evidence of a motivation or suggestion for modifying a reference to provide the claimed subject matter.

In short, there is no evidence that the references relied upon, whether taken alone, combined or modified, would provide the features of the claims discussed above. It is therefore respectfully submitted that the claims are allowable for these reasons.

As further regards all of the obviousness rejections of the claims, it is respectfully submitted that not even a *prima facie* case has been made in the present case for obviousness, since the Office Actions to date never made any findings, such as, for example, regarding in any way whatsoever what a person having ordinary skill in the art would have been at the time the claimed subject matter of the present application was made. (<u>See</u> *In re Rouffet*, 47 U.S.P.Q.2d 1453, 1455 (Fed. Cir. 1998) (the "factual predicates underlying" a *prima facie* "obviousness determination include the scope and content of the prior art, the differences between the prior art and the claimed invention, and the level of ordinary skill in the art")). It is respectfully submitted that the proper test for showing obviousness is what the "combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art", and that the Patent Office must provide particular findings in this regard -- the evidence for

which does not include "broad conclusory statements standing alone". (See *In re Kotzab*, 55 U.S.P.Q. 2d 1313, 1317 (Fed. Cir. 2000) (citing *In re Dembiczak*, 50 U.S.P.Q.2d 1614, 1618 (Fed. Cir. 1999) (obviousness rejections reversed where no findings were made "concerning the identification of the relevant art", the "level of ordinary skill in the art" or "the nature of the problem to be solved"))). It is respectfully submitted that there has been no such showings by the Office Actions to date or by the Advisory Action.

In fact, the present lack of any of the required factual findings forces both Appellants and this Board to resort to unwarranted speculation to ascertain exactly what facts underly the present obviousness rejections. The law mandates that the allocation of the proof burdens requires that the Patent Office provide the factual basis for rejecting a patent application under 35 U.S.C. § 103. (See *In re Piasecki*, 745 F.2d 1468, 1472, 223 U.S.P.Q. 785, 788 (Fed. Cir. 1984) (citing *In re Warner*, 379 F.2d 1011, 1016, 154 U.S.P.Q. 173, 177 (C.C.P.A. 1967))). In short, the Examiner bears the initial burden of presenting a proper prima facie unpatentability case -- which has not been met in the present case. (See *In re Oetiker*, 977 F.2d 1443, 1445, 24, U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992)).

In short, all of claims 1 to 22 are allowable.

CONCLUSION

In view of the above, it is respectfully requested that the rejections of claims 1 to 22 be reversed, and that these claims be allowed as presented.

Respectfully submitted,

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APPENDIX

1. An electrochemical sensor comprising:

a solid electrolyte element including at least one first electrode, at least one second electrode and at least one heating element, the at least one second electrode being situated closer than the at least one first electrode to the at least one heating element, the at least one second electrode being coupled to ground, the at least one first electrode coacting with the at least one second electrode and being negatively polarized.

2. (Twice Amended) The sensor according to claim 1, further comprising an arrangement for providing a negative operating voltage so that coupling of a heater voltage is effectively blocked and wherein the negative operating voltage is applied to the negatively polarized electrode.

3. The sensor according to claim 2, further comprising a measurement circuit, the negative operating voltage powering the measurement circuit.

4. (Twice Amended) The sensor according to claim 2, further comprising a circuit arrangement for analyzing a negative probe voltage (U_S), and wherein the negative operating voltage (U_B) powers the circuit arrangement.

5. The sensor according to claim 1, wherein the at least one second electrode lies in a layer plane of the solid electrolyte element, the at least one second electrode having approximately the same surface size as the at least one first electrode.

6. The sensor according to claim 1, wherein the at least one second electrode is a reference electrode communicating with a reference atmosphere, and the at least one first electrode is a measurement electrode.

7. The sensor according to claim 1, wherein the solid electrolyte element is a ceramic element.

8. The sensor according to claim 1, wherein the solid electrolyte element is ZrO_2.

9. (Amended) The sensor according to claim 1, wherein the second electrode is in a reference duct and wherein the reference duct is situated between the at least one first electrode and the at least one heating element.

10. The sensor according to claim 1, wherein a heating voltage of 12 V is applied to the at least one heating element.

11. The sensor according to claim 1, wherein the at least one heating element is embedded in an electrical insulator.

12. (Amended) The sensor according to claim 1, wherein a portion of the second electrode extends over the width of a reference duct and additionally acts as a shield against any coupling of heater voltage U_H and wherein the reference duct is situated between the at least one first electrode and the at least one heating element.

13. An electrochemical sensor comprising:

a solid electrolyte element including at least one first electrode, at least one second electrode and at least one heating element, the at least one second electrode being situated closer than the at least one first electrode to the at least one heating element, the at least one second electrode being coupled to ground, the at least one first electrode coacting with the at least one second electrode and being negatively polarized such that coupling of heater voltage is effectively blocked.

14. The sensor according to claim 1, wherein a heating voltage is applied to the at least one heating element.

15. The sensor according to claim 1, wherein the solid electrolyte element includes a solid electrolyte tube that is closed on one side.

16. The sensor according to claim 15, further comprising an arrangement to provide a negative operating voltage so that a coupling of a heater voltage is effectively blocked, the

negative operating voltage being applied to the negatively polarized electrode.

17. The sensor according to claim 16, further comprising a measurement circuit, the negative operating voltage powering the measurement circuit.

18. The sensor according to claim 16, further comprising a circuit arrangement for analyzing a negative probe voltage, the negative operating voltage powering the circuit arrangement.

19. The sensor according to claim 15, wherein the solid electrolyte element includes a ceramic element.

20. The sensor according to claim 15, wherein the solid electrolyte element includes ZrO_2.

21. An electrochemical sensor arrangement comprising:

a solid electrolyte element including a reference duct, ZrO_2, at least one first electrode, at least one second electrode, at least one heating element and a reference duct situated between the at least one first electrode and the at least one heating element, the at least one second electrode coupled to ground, having approximately the same surface size as the at least one first electrode, lying in a layer plane of the solid electrolyte element, and situated inside the reference duct closer than the at least one first electrode to the at least one heating element, the at least one first electrode coacting with the at least one second electrode and being negatively polarized;

an arrangement to provide a negative operating voltage so that a coupling of a heater voltage is effectively blocked, the negative operating voltage being applied to the negatively polarized electrode;

a measurement circuit, the negative operating voltage powering the measurement circuit; and

a circuit arrangement to analyze a negative probe voltage, the negative operating voltage powers the circuit arrangement.

22. The sensor according to claim 21, wherein the solid electrolyte element includes a solid electrolyte tube that is closed on one side.